IN THE CLAIMS:

Please amend the claims as follows:

1-61. (canceled)

62. (withdrawn) A polypeptide comprising a sequence or a fragment of the sequence of: SEQ ID NO: 7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22, wherein the sequence or fragment of the sequence includes the Region I or Region II repeat sequences.

63. (withdrawn) A polypeptide consisting of the amino acids in SEQ ID NO: 7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22.

64. (withdrawn) A polynucleotide encoding a polypeptide as claimed in claim 62.

65. (withdrawn) A polynucleotide encoding a polypeptide as claimed in claim 63.

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66. (withdrawn) A purified DNA or RNA sequence that hybridizes under moderate or high stringency conditions to the polynucleotide of claim 64 or at least to 15 nucleotides thereof.

67. (withdrawn) Purified antibodies that bind to a polypeptide of claim 62.

68. (withdrawn) Purified antibodies according to claim 67, wherein the antibodies are monoclonal antibodies.

69. (withdrawn) Purified antibodies according to claim 67, wherein the antibodies are polyclonal antibodies.

70. (withdrawn) An immunological complex comprising a polypeptide of claim 62 and an antibody that specifically recognizes said polypeptide.

71. (withdrawn) A method for detecting infection by Bordetella, wherein the method comprises providing a composition comprising a biological material suspected of being infected with Bordetella, and assaying for the presence of a polypeptide of claim 62.

72. (withdrawn) The method as claimed in claim 71, wherein the polypeptide is assayed by electrophoresis or by immunoassay with antibodies that are immunologically reactive with the polypeptide.

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73. (withdrawn) An *in vitro* diagnostic method for the detection of the presence or absence of antibodies, which bind to an antigen comprising a polypeptide of claim 62, wherein the method comprises contacting the antigen with a biological fluid for a time and under conditions sufficient for the antigen and antibodies in the biological fluid to form an antigen-antibody complex, and detecting the formation of the complex.

74. (withdrawn) The method as claimed in claim 73, which further comprises measuring the formation of the antigen-antibody complex.

75. (withdrawn) The method as claimed in claim 73, wherein the formation of antigen-antibody complex is detected by immunoassay based on at least one of Western blot technique, ELISA, indirect immunofluorescence assay, and immunoprecipitation assay.

76. (withdrawn) A diagnostic kit for the detection of the presence or absence of antibodies, which bind a polypeptide of claim 62 or mixtures thereof, wherein the kit comprises an antigen comprising a polypeptide of claim 62 or mixtures of said polypeptides, and means for detecting the formation of immune complex between the antigen and antibodies, wherein the means are present in an amount sufficient to perform said detection.

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77. (withdrawn) An immunogenic composition comprising at least one polypeptide of claim 62 in an amount sufficient to induce an immunogenic or protective response *in vivo*, and a pharmaceutically acceptable carrier therefore.

78-80. (canceled)

81. (withdrawn) An immunogenic composition comprising a polynucleotide according to claim 64.

82. (canceled)

83. (withdrawn) A method for detecting the presence or absence of *Bordetella* comprising:

(1) contacting a sample suspected of containing genetic material of *Bordetella* with at least one nucleotide probe, and

(2) detecting hybridization between the nucleotide probe and the genetic material in the sample,

wherein said nucleotide probe is complementary to a polynucleotide sequence as claimed in claim 64.

84. (canceled)

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85. (withdrawn) An immunogenic composition consisting essentially of:

(A) a polypeptide comprising at least one of Region I and Region II of a pertactin of *Bordetella pertussis*;

(B) a polypeptide comprising at least one of Region I and Region II of a pertactin of *Bordetella parapertussis*;

(C) a polypeptide comprising at least one of Region I and Region II of a pertactin of *Bordetella bronchiseptica* strain 9.73 and a polypeptide comprising at least one of Region I and Region II of a pertactin of *Bordetella bronchiseptica* of strain SEI.

86. (withdrawn) An immunogenic composition consisting essentially of:

(A) a pertactin of *Bordetella bronchiseptica*;

(B) FHA of *Bordetella bronchiseptica*; and

(C) a pertactin of *Bordetella parapertussis*.

87. (withdrawn) The immunogenic composition as claimed in claim 86, wherein the pertactin of *Bordetella bronchiseptica* is from strain 9.73.

88. (withdrawn) The immunogenic composition as claimed in claim 86, where the FHA of *Bordetella bronchispetica* is from strain 9.73.

89-94. (canceled)

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95. (withdrawn) A method of treating *Bordetella* infections, comprising administering the antibodies of claim 67.

96. (withdrawn) A microarray comprising microbeads, wherein said microbeads each bears multiple copies of a polynucleotide according to claim 64 or a fragment thereof, and wherein the polynucleotide or fragment thereof is different from one microbead to another.

97. (withdrawn) A DNA chip, wherein the chip comprises at least one polynucleotide according to claim 66 or fragment thereof.

98-114. (canceled)

115. (new) An immunogenic composition comprising a mixture of *Bordetella bronchiseptica* pertactins or pertactin fragments comprising Region I, Region II, or Regions I and II,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered.

116. (new) The immunogenic composition of claim 115, wherein the number of PQP amino acid sequences in Region II in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments is 6, 8, or 9.

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117. (new) The immunogenic composition of claim 115, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

118. (new) The immunogenic composition of claim 115, wherein the number of PQP amino acid sequences in Region II differs between at least two of said *Bordetella bronchiseptica* pertactins or pertactin fragments.

119. (new) The immunogenic composition of claim 118, wherein the composition comprises at least one polypeptide comprising SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22.

120. (new) The immunogenic composition of claim 118, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

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121. (new) The immunogenic composition of claim 115, wherein the composition comprises at least one polypeptide comprising SEQ ID NO: 7, SEQ ID NO: 8, SEQ ID NO: 9, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22.

122. (new) The immunogenic composition of claim 115, wherein a GGXXP amino acid sequence in Region I differs between at least two of said *Bordetella bronchiseptica* pertactins or pertactin fragments.

123. (new) The immunogenic composition of claim 122, wherein GGXXP is GGAVP, GGFGP, GGGVP, or GGFDP.

124. (new) The immunogenic composition of claim 115, wherein the number of GGAVP amino acid sequences in Region I in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments is 1 or 3.

125. (new) The immunogenic composition of claim 115, wherein the number of GGFGP amino acid sequences in Region I in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments is 1 or 2.

126. (new) The immunogenic composition of claim 115, wherein Region I in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments comprises the amino acid sequence GGFDP.

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127. (new) The immunogenic composition of claim 115, wherein Region I in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments comprises the amino acid sequence GGGVP.

128. (new) The immunogenic composition of claim 115, wherein the number of GGAVP, GGFGP, GGGVP, or GGFDP amino acid sequences in Region I differs between at least two of said *Bordetella bronchiseptica* pertactins or pertactin fragments.

129. (new) The immunogenic composition of claim 128, wherein the composition comprises at least one polypeptide comprising SEQ ID NO: 7, SEQ ID NO: 8, or SEQ ID NO: 9.

130. (new) The immunogenic composition of claim 128, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

131. (new) The immunogenic composition according to any one of claims 115, 118, or 128, further comprising a pharmaceutically acceptable vehicle.

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132. (new) A kit comprising an immunogenic composition according to any one of claims 115, 118, or 128, and a mode of administering the composition to an animal.

133. (new) The immunogenic composition of claim 115, wherein the composition further comprises at least one *Bordetella pertussis* pertactin or pertactin fragment comprising Region I, Region II, or Regions I and II, or one *Bordetella parapertussis* pertactin or pertactin fragment comprising Region I, Region II, or Regions I and II.

134. (new) The immunogenic composition of claim 115, wherein the number of GGXXP amino acid sequences in Region I differs between at least two of said *Bordetella bronchiseptica* pertactins or pertactin fragments.

135. (new) An immunogenic composition comprising a mixture of purified pertactins or pertactin fragments comprising Region II,

wherein said pertactins or pertactin fragments are of *Bordetella bronchiseptica*, *Bordetella parapertussis*, or *Bordetella pertussis*,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered, and

wherein the number of PQP amino acid sequences in Region II differs between at least two of said purified pertactins or pertactin fragments.

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136. (new) The immunogenic composition of claim 135, wherein at least one of said pertactins or pertactin fragments is of *Bordetella bronchiseptica*.

137. (new) The immunogenic composition of claim 136, wherein the number of PQP amino acid sequences in Region II in at least one of said pertactins or pertactin fragments of *Bordetella bronchiseptica* is 6, 8, or 9.

138. (new) The immunogenic composition of claim 135, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

139. (new) The immunogenic composition of claim 135, wherein the composition comprises at least one polypeptide comprising SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22.

140. (new) An immunogenic composition comprising a mixture of purified pertactins or pertactin fragments comprising Region I,

wherein said pertactins or pertactin fragments are of *Bordetella bronchiseptica*, *Bordetella parapertussis*, or *Bordetella pertussis*,

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in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein the GGXXP amino acid sequences or the number of GGXXP amino acid sequences in Region I differ between at least two of said purified pertactins or pertactin fragments.

141. (new) The immunogenic composition of claim 140, wherein GGXXP is GGAVP, GGFGP, GGGVP, or GGFDP.

142. (new) The immunogenic composition of claim 140, wherein at least one of said pertactins or pertactin fragments is of *Bordetella bronchiseptica*.

143. (new) The immunogenic composition of claim 142, wherein the number of GGAVP amino acid sequences in Region I in at least one of said pertactins or pertactin fragments of *Bordetella bronchiseptica* is 1 or 3.

144. (new) The immunogenic composition of claim 142, wherein the number of GGFGP amino acid sequences in Region I in at least one of said pertactins or pertactin fragments of *Bordetella bronchiseptica* is 1 or 2.

145. (new) The immunogenic composition of claim 142, wherein Region I in at least one of said *Bordetella bronchiseptica* pertactins or pertactin fragments comprises the amino acid sequence GGGVP.

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146. (new) The immunogenic composition of claim 142, wherein Region I in at least one of said *Bordetella bronchiseptica* pertactin or pertactin fragments comprises the amino acid sequence GGFDP.

147. (new) The immunogenic composition of claim 140, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

148. (new) The immunogenic composition of claim 140, wherein the composition comprises at least one polypeptide comprising SEQ ID NO: 7, SEQ ID NO: 8, or SEQ ID NO: 9.

149. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising Region II,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein the number of PQP amino acid sequences in Region II of said *Bordetella bronchiseptica* pertactin or pertactin fragment is 6, 8, or 9.

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150. (new) The immunogenic composition of claim 149, wherein the pertactin or pertactin fragment comprises SEQ ID NO: 14, SEQ ID NO: 16, SEQ ID NO: 18, SEQ ID NO: 19, SEQ ID NO: 20, SEQ ID NO: 21, or SEQ ID NO: 22.

151. (new) The immunogenic composition of claim 149, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

152. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising region I,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein the number of GGXXP amino acid sequences in Region I of said *Bordetella bronchiseptica* pertactin or pertactin fragment is 1 or 2.

153. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising Region I,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

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wherein the number of GGAVP amino acid sequences in Region I of said *Bordetella bronchiseptica* pertactin or pertactin fragment is 1 or 3.

154. (new) The immunogenic composition of claim 153, wherein the pertactin or pertactin fragment comprises SEQ ID NO: 7 or SEQ ID NO: 9.

155. (new) The immunogenic composition of claim 153, wherein the composition further comprises at least one adhesin or toxin of *Bordetella*;

wherein the adhesin is selected from filamentous hemagglutinin, agglutinogen 2, and agglutinogen 3, and

wherein the toxin is selected from pertussis toxin, dermonecrotic toxin, tracheal cytotoxin, and adenylate cyclase-hemolysin.

156. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising Region I,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein the number of GGFGP amino acid sequences in Region I of said *Bordetella bronchiseptica* pertactin or pertactin fragment is 2.

157. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising Region I,

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in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein Region I of said *Bordetella bronchiseptica* pertactin or pertactin fragment comprises the amino acid sequence GGFDP.

158. (new) An immunogenic composition comprising a purified *Bordetella bronchiseptica* pertactin or pertactin fragment comprising Region I,

in an amount sufficient to induce a humoral or cellular immune response in an animal to which the immunogenic composition is administered,

wherein Region I of said *Bordetella bronchiseptica* pertactin or pertactin fragment comprises the amino acid sequence GGGVP.

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